

Figure 3.1-4. WSMR Restricted Airspace

photography; fixed and rotary wing security patrols; live air-to-air and air-to-ground gunnery; recovery of missiles, rockets, boosters, and aerial targets; and NASA and military aircraft training activities. (WSMR 1994)

Airport facilities that impact WSMR and surrounding airspace include: (WSMR 1994)

- Condron Airstrip on WSMR - approximately 4 takeoffs and landings per day
- Stallion Airstrip on WSMR - approximately 4 takeoffs and landings per week
- Oscura Airstrip on WSMR - approximately 6 takeoffs and landings per year
- WSSH Airstrip on WSMR - activity varies based on NASA needs
- Las Cruces International Airport 60 km (40 mi) southwest of WSMR - approximately 6 commercial flights daily plus general aviation activity
- Alamogordo/White Sands Regional Airport 6.4 km (4 mi) east of WSMR - approximately 25 takeoffs and landings per day
- El Paso International Airport 59 km (37 mi) south of WSMR - approximately 160 takeoffs and landings per day
- Holloman AFB adjacent to the western edge of WSMR - takeoffs and landings vary with operational requirements

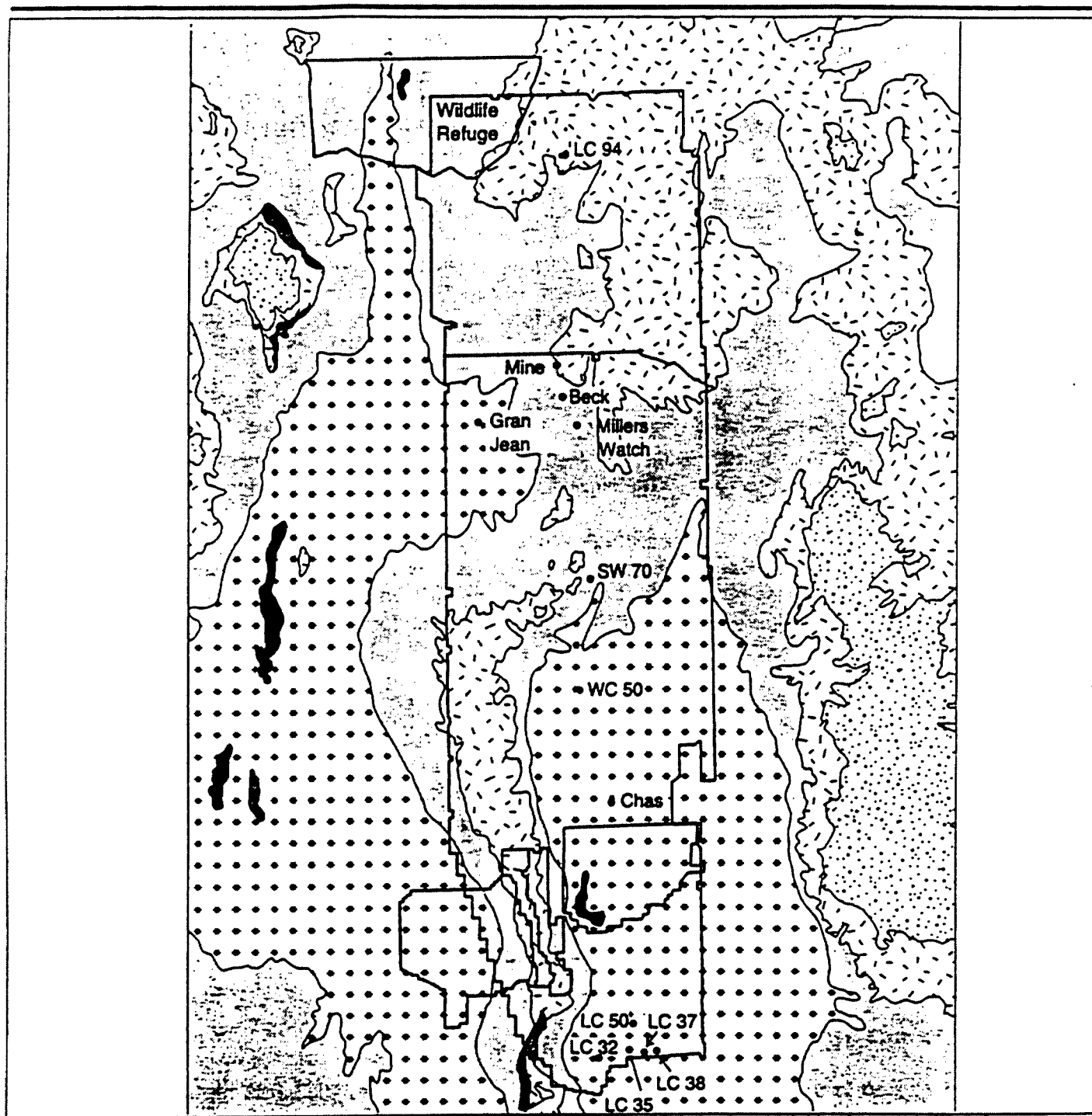
3.1.2.4 Biological Resources

WSMR has a variety of vegetation and habitat types that support a diversity of wildlife. Habitats are widely dispersed and form a mosaic of scrubs, grasslands, savannas, woodlands, forests, and wetlands. These habitats are summarized along with relative coverages in Table 3.1-1. WSMR vegetation areas are shown in Figure 3.1-5. (WSMR 1994)

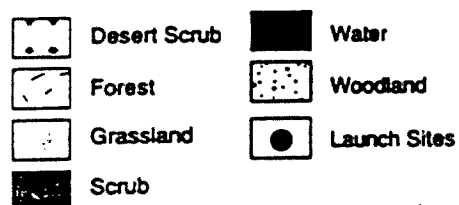
Vegetation

WSMR is located in south central New Mexico near the northern edge of the Chihuahuan Desert region. The relatively warm, dry climate is the primary factor influencing vegetation in the area. Most of the surface of WSMR is located on the floor of the Tularosa Basin and Jornada del Muerto in south central New Mexico where summer rainfall is low. Vegetation on these lowlands includes Chihuahuan desert scrub, closed-basin scrub, and desert grasslands. (WSMR 1994)

Rainfall increases and temperatures decreases with elevation in the Oscura and San Andreas Mountains. While soils, aspect, slope, and other factors play a role in determining the vegetation present at a given location, climatic effects of increasing elevation are the predominant environmental factors. At elevations above the desert scrub and grasslands regions, plains-mesa grasslands may occur. Grasslands and plains-mesa sand scrub are indicative of WSMR's location near the western edge of prairies that characterize the central portion of the United States. Both desert and plains-mesa grasslands form a broad savanna-like ecotone at higher elevations with coniferous woodlands dominating the cooler highlands of the Oscura and San Andreas Mountains.



EXPLANATION



0 16 32 Kilometers
0 10 20 Miles

Vegetation Communities

Figure 3.1-5. WSMR Vegetation Map

Junipers (*Juniperus* spp.) characterize the tree story of this transitional area. As slopes become steeper, the savanna develops a more woodland character and montane scrub vegetation forms part of the habitat mosaic. Gradually, pinyon pines (*Pinus edulis*) become more common until, near the summits of both mountain ranges, coniferous woodlands are dominated by pinyon. Montane scrub continues to be present into the highlands. On Salinas Peak, montane coniferous forest dominated by ponderosa pine (*Pinus ponderosa*) is present. (WSMR 1994)

Table 3.1-1. Vegetation Types Occurring on WSMR

<u>Vegetation Type</u>	<u>Hectares (acres)</u>	
Coniferous Woodlands (Pinyon Pine Series)		
Pinyon Pine	11,200	(27,700)
Pinyon Pine and Mountain Mahogany	23,400	(57,800)
Savanna and Plains-mesa Grassland	91,200	(225,400)
Desert Grassland and Plains-mesa Sandscrub	174,000	(430,000)
Chihuahuan Desert Scrub		
Creosote Bush	222,000	(548,000)
Mesquite	114,600	(283,200)
Lava	16,900	(41,800)
Closed-basin Scrub		
Fourwing Saltbush and Tarbush	107,900	(266,600)
Arroyo Riparian and Wetlands	10,000	(24,700)
Barren Land	69,500	(171,700)
Dune Land	35,600	(88,000)
<u>Notes:</u>		
<i>Does not include 9,400 ha (23,200 ac) of WSMR, which New Mexico Natural Heritage Program (NMNHP) (1992) mapped as having no associated data.</i>		
<i>The NMNHP (1992) provides no acreage for the lower montane coniferous forest vegetation.</i>		

Source: WSMR 1994

The WSMR LC-39 area consists primarily of mesquite dunes. Growing within the mesquite is four-wing saltbush, tansy mustard and an occasional soaptree yucca. In the interdune spaces, the most common plants are broom snakeweed, soaptree yucca and mesa dropseed. Other species occurring locally are sand sagebrush, sand bluestar, purple sand verbera, and Russian thistle. This type of vegetation has been classified as mesquite scrub. (WSMR 1996-A)

The proposed WSSH takeoff site is located on alkali flats. Vegetation is scarce because of the harsh environment resulting from alkaline soil conditions and susceptibility to flooding. The site consists of gypsum soils. The only vegetation known to occur in this type of land is sporadic iodine bush. Small quantities of picklewood, Indian ricegrass and salt cedar have been recorded in nearby areas. Overall, ground cover in the surrounding area has been estimated at less than 20 percent.

Wetlands and Floodplains

Extensive pockets of wetlands have been identified south of Route 6 and at the lower end of several canyons. Some of the other large areas of identified wetlands include Lake Lucero and Malpais Springs. Isolated springs and sinkholes and small wetland areas exist throughout the Tularosa Basin and Jornada del Muerto. Springs also occur in the San Andreas and Oscura mountains. Of the 67,706 ha (167,300 ac) of WSMR searched in the Geographic Information System (GIS) database, only 3,816 ha (9,430 ac) or 5 percent of the land surface was mapped as wetlands. (WSMR 1996)

Flooding on WSMR occurs infrequently, with the area of greatest concern being the Main Post. No floodplain maps or other information on flood prone areas is available. (WSMR 1996)

Wildlife

The primary wildlife species known to inhabit the WSMR LC-39 site is the Texas horned lizard (WSMR 1996-A). Wildlife is also scarce in the alkali flats of the WSSH site due to the extreme environment. No wildlife species are known to inhabit the takeoff site area (DOD 1992).

3.1.2.5 Threatened, Endangered, and Sensitive Species

Forty-four (44) state and federal listed threatened and endangered wildlife species, 38 sensitive plant species, and two sensitive habitat vegetation types occur or may occur on WSMR/WSTF. The only listed endangered plant species known to occur on WSMR is Todson's pennyroyal.

Federally listed endangered animal species include the interior least tern, northern Aplomado falcon, American peregrine falcon, and whooping crane. The bald eagle is federally threatened. Sensitive habitat includes black gamma/long leaf mormon tea and pinyon pine/scribner needlegrass. A complete listing of sensitive plant and animal species that occur or potentially occur on WSMR is provided in Appendix B. (WSMR 1994)

Identification of threatened and endangered species is controlled by USFWS, New Mexico Forestry Resource Conservation Division (NMFRCD), and New Mexico Department of Game and Fish (NMDGF) under the authority of the Endangered Species Act (Federal) and the Wildlife Conservation Act (State). WSMR's Environmental Services Division maintains information on these species and their specific locations (U.S. Army 1994-A). No threatened, endangered or sensitive plant or animal species are known to inhabit either of the proposed takeoff site areas. (DOD 1992; WSMR 1996-A)

3.1.2.6 Cultural Resources

Two NRHP sites are located within WSMR boundaries. Three New Mexico State Register of Cultural Properties sites are located in areas on or immediately adjacent to WSMR, one of which is also an NRHP site. (WSMR 1994)

Trinity Site National Historic Landmark, test site for the first atomic bomb, is located in the north-central portion of the range approximately 13 km (8 mi) southeast of SRC. It is both a National Historic Landmark and an NRHP property. The site encompasses 14,736 ha (36,480 ac) and includes Ground Zero (detonation site), various instrumentation bunkers, the McDonald Ranch, a nearby base camp, and "Jumbo," a huge steel vessel designed to enclose plutonium in the event of an unsuccessful test. (WSMR 1994)

LC-33 is a National Register site and a National Historic Landmark located 8 km (5 mi) east of the WSMR Main Post in the Nike Avenue launch complexes area. The U.S. Army blockhouse and gantry crane were used in the study and launch of V-2 and Viking rockets. The blockhouse was constructed in 1945 and was used as a laboratory for studying captured German V-2 rockets. (WSMR 1994)

In addition to military structures, historic ranches and homesteads are scattered throughout the missile range. Mining sites are located primarily in mountainous regions of the San Andreas, Oscura, and Jarilla ranges. The 241 historic sites identified on WSMR are distributed according to general type as follows: (1) homestead/ranch - 80 sites, (2) mining - 101 sites, (3) stage stops - 2 sites, and (4) other - 58 sites.

Two New Mexico State Register of Cultural Properties sites exist on WSMR. Mockingbird Gap is located approximately 0.4 km (0.25 mi) south of U.S. Highway 380, north of the Oscura Mountains. The White Sands National Monument (WSNM) Historic District and Parabolic Dune Hearth Mounds within the monument are located north of U.S. Highway 70, approximately 16 km (10 mi) west of Alamogordo, New Mexico. (WSMR 1994)

Mountainous regions in the northern portion of WSMR have been used as traditional religious sites by Native Americans. The Oscura Mountains are considered important to the Mescalero Apache tribe with prayer sites located throughout them. Salinas Peak in the San Andreas Mountains is considered important to the eastern Chiricahua Apaches. (WSMR 1994)

As of September 1993, archaeological surveys have been conducted on 6.7 percent or 59,500 ha (147,000 ac) of WSMR (WSMR 1994). Large cultural resource sites are known to occur on the border of the lakebed area near WSSH along Range Road 7. Cultural resources are also present along Range Road 10. WSSH is approximately 3 to 5 km (2 to 3 mi) north of the border of WSNM. There are no archeological resources on the proposed takeoff site. (DOD 1992)

No properties listed on the NRHP or the New Mexico State Register of Cultural Properties are located in the immediate vicinity of the WSMR LC-39 site. LC-33 is approximately 16 km

(10 mi) west. The proposed Rattlesnake Hill National Register Archeological District, consisting of 11 residential sites and 70 camp sites, is located approximately 10 km (6 mi) southeast on lands administered by the Bureau of Land Management (BLM). There are significant archeological resources in the WSMR LC-39 area. Some mitigation may be required, primarily through locating X-33 facilities in areas which do not impact any of the sites. (WSMR 1996-A/B)

3.1.2.7 Water Resources

Water supply sources are a critical concern at many WSMR installations. On-site sources of potable water principally involve localized groundwater sources. The current source of water for the Main Post originates from four watersheds. The water supply has a natural recharge of the potable water aquifer at 38 percent of annual withdrawal. Currently 11 wells serve the Main Post area with the capability to serve an effective population in excess of 14,400 people. Average daily usage in 1989 was 7.2 mLd (1.9 mgd) and daily peak usage was 14.7 mLd (3.9 mgd). The practical capacity of the Main Post wells is 32 mLd (8.4 mgd) based on a 16-hour pumping record. The Main Post area has a maximum storage capacity of 11.4 million L (3 million gal), which can support an effective population of 10,000 and an actual population of over 13,000. Well water is treated at the Main Post drinking water treatment facility. Treatment consists of sedimentation, disinfection, and fluoridation. (WSMR 1996-A)

At SRC, the primary source of water is groundwater. However, water must be treated prior to storage and distribution. Only one of the two wells is operational. Water storage consists of two 75,000 L (20,000 gal) tanks for untreated water, and one 380,000 L (100,000 gal) tank for treated water. The historical average consumption level is 36,300 Lpd (9,600 gpd) with a pumping capacity of 380,000 Lpd (100,000 gpd). SRC has a desalinization plant consisting of three 190,000 Lpd (50,000 gpd) ionics electrodialysis reversing systems. (WSMR 1996-A)

Water used at Oscura and RCRC is hauled by truck from existing water supplies. Buildings within these centers have their own storage tanks with domestic pressure systems. Water is hauled from existing sources to meet domestic and industrial water requirements at WSSH. (WSMR 1996-A)

Water at WSTF is supplied through two 305 m (1,000 ft) wells located west of the facility. Water is withdrawn from the Jornada aquifer through a permanent water withdrawal right with BLM. Wells are located within 7 km (4 mi) of WSTF boundaries, and water is pumped through transit pipes across land held under easement with BLM. Water is pumped approximately 10 km (6 mi) to a 3.8 million L (1 million gal) storage tank for distribution. Water is chlorinated at the WSTF facility. While 2,104 ha (5,200 ac) of water withdrawal rights apply, only 121 ha (300 ac) per year are presently being used. (WSMR 1994)

3.1.2.8 Geology and Soils

WSMR is located within the Mexican Highland section of the basin and range province. The area is characterized by alternating north-south aligned depressions and uplifted structural blocks (fault blocks). The eastern two-thirds of WSMR is located in the Tularosa Basin. The Sacramento and

Jarilla Mountains are located just east of the WSMR boundary. The western one-third of the base is occupied predominantly by the San Andreas Mountains, with the western slopes defining the western boundary. The Organ Mountains, a southern extension of the San Andreas Range, abut the southwest corner of WSMR. (WSMR 1994) Mountain ranges within WSMR and adjacent call-up areas vary from 6 to 48 km (4 to 30 mi) wide and up to 97 km (60 mi) long, with crests ranging from 1,980 to 2,740 m (6,500 to 9,000 ft). (WSMR 1994)

WSMR is located in the Rio Grande Rift, a region characterized by recent volcanism and active faulting. Rifting has resulted in continued movement along faults located at the boundaries of the Tularosa Basin and Jornada del Muerto. Three major fault zones occur partly within the boundaries of WSMR. The western Tularosa zone occurs along the eastern base of the San Andreas, Organ, and Franklin Mountains. Faults in this zone have moved during the late Pleistocene epoch (2 million to 8,000 years ago) and/or early Holocene epoch (within the last 8,000 years). The eastern Tularosa fault zone is identified by the Alamogordo fault located along the base of the Sacramento Mountains. Studies along this fault identify movement during the Pleistocene and possibly the Holocene eras. The third fault zone primarily comprises surface faults occurring within the Tularosa Basin east of the Organ Mountains. Movement along these faults has occurred within the last 2 million years and may be in response to activity along the major Tularosa fault zones. (WSMR 1994)

No major earthquake (greater than IV on the Modified Mercalli Intensity Scale) has occurred within the boundaries of WSMR, since historic recordkeeping began in 1849. Based on the young age of faults within WSMR and geologic records, a major earthquake at WSMR is a possibility. It is estimated that the largest earthquake that can reasonably be expected to occur at WSMR may result in displacements of 3 to 4 m (10 to 13 ft) along a fault length of 35 to 50 km (22 to 31 mi). The Rio Grande Rift system is still active, and there is evidence of faulting occurring as recently as 5,000 years ago. (WSMR 1994)

Potential geologic resources include gypsum, hydrocarbons, and minor amounts of a variety of minerals. Mining operations are not presently conducted within WSMR. However, previous mining activity in the WSMR area and neighboring mountains has been documented. As of 1978, there were 138,160 ha (341,388 ac) of state mineral rights, and the U.S. Congress previously set aside funds to purchase mining claims within WSMR. All but approximately nine claims have been purchased, and three are under lease. (WSMR 1994)

A soil survey identified 30 Soil Conservation Service (SCS) soil series, or soil units, covering the range area. Each soil series is characterized by differing composition, slope, texture of the surface layer and source material. Soils identified at WSMR include the gypsum dunes and lakebed deposits of WSNM and the Lake Lucero area, rocky soils associated with rough foothills and slopes of neighboring mountains, and the sandy loams of the Tularosa Basin and Jornada del Muerto. (WSMR 1994)

WSMR LC-39 is low dune land with loamy fine sand to fine sand soil. The topography is gently undulating to undulating between dunes. Water runoff is slow with low potential for water

erosion. Wind erosion is high with actively blowing sand. Fertility and organic matter are low. (WSMR 1996-A)

Soil resources at WSSH are classified as gypsum land consisting of gypsum deposits overlying lacustrine sediments on broad level floors of a relic lake. The alkali soil results from a shallow water table and compacted gypsum soils with very low permeability. The soil typically has slopes less than 1 percent and is poorly drained. The soil has several limitations for shallow excavations because the water table is so high. Gypsum is about 0.3 m (1 ft) thick on the perimeter of the lakebed and more than 3 m (12 ft) thick near the center. The surface is level and smooth, and water may pond in low areas after it rains. (DOD 1992)

3.1.2.9 Health and Safety

Comprehensive health and safety programs and emergency response systems have been established at both WSMR (controlled by the U.S. Army) and WSTF (controlled by NASA). Ground operations on WSTF and WSSH are controlled by NASA and must comply with JSC's WSTF Safety Manual. Ground and flight safety on WSMR are controlled by the Army and must comply with Army and WSMR safety regulations. In addition, OSHA regulations (29 CFR 1910) must be complied with. Specific safety and health requirements for the X-33 Program would be developed by WSMR in conjunction with NASA and the X-33 Phase II Industry Partner. As a minimum, the X-33 Program can expect to submit preliminary and final site plans, safety standard operating procedures, a safety assessment report, and ground safety standard operating plans. These documents will be prepared in accordance with WSMR, Army, and DOD regulations. (WSMR 1994)

The WSMR Missile Flight Safety Office would ensure that flight plans meet range safety requirements, calculate the predicted flight hazard and dispersion areas using reasonably foreseeable performance anomalies and adverse wind conditions, and prepare the missile flight safety operational plan. (WSMR 1994)

WSMR and WSTF each have their own fire and emergency medical services. WSMR has a complete U.S. Army clinic capable of handling most medical emergencies. WSTF has a NASA-run medical clinic and ability to transport injured personnel to the hospital in Las Cruces, New Mexico. (DOD 1992)

3.1.2.10 Operational Noise

Airspace over WSMR is the primary environment containing the major noise sources on the range. Training activities include bomb delivery, Air Combat Command and Air National Guard air-to-air combat and supersonic flight tactics, and other military exercises. In addition, drone flights and tests of missiles, rockets, and space vehicles occur. Large areas of the airspace are used as safety buffer zones for missile and rocket firings. Ground systems and commercial systems are also tested and evaluated at WSMR. (WSMR 1994)

Noise levels at the Main Post area (the only range population center), the WSMR property boundary, and San Andreas National Wildlife Refuge (located approximately 19 km (12 mi) north of the Main Post area) have been estimated to be 55 to 65, 45 to 55, and 45 dBA, respectively. (WSMR 1994)

Generally, flight activities are at a high enough altitude and a low enough frequency to generate sound levels anticipated to be no greater than 70 dBA, which is the sound level of freeway traffic. Supersonic aircraft operations can generate sound pressure levels greater than 115 dBA. However, the average sonic boom noise level for existing activities was expected to be in the range of 50 to 60 dBA at distances varying from 8-16 km (5-10 mi) from the source. (WSMR 1994)

3.1.2.11 Transportation

Activities at WSMR require an extensive network of roadways, both on and off the range. The primary interstates serving the region are Interstate Highways 10 and 25. Interstate Highway 25 extends from Las Cruces beyond Albuquerque, to the north, with two lanes in each direction. It is in generally good condition. Interstate Highway 10 intersects Interstate Highway 25 at Las Cruces, New Mexico, and extends to Lordsburg, New Mexico, and beyond. It has two lanes in each direction and is in generally good condition. Other major roads serving WSMR include U.S.-designated Highways 54, 60, 70, 82, and 380. All are in good condition and adequately support current levels of traffic. (WSMR 1994)

There are seven primary access points to WSMR. U.S. Highway 70 provides direct access through the Small Missile Range gate and along Range Road 1 at the Las Cruces and El Paso gates. U.S. Highway 54 provides three access gates from local roads at Orogrande Range Camp (ORC), Tula gate in Tularosa, and ORC. U.S. Highway 380 provides access from Range Road 7 at SRC. Each of the seven access points has a gate supported by a guard house. Visitors and their vehicles are subject to inspections prior to entering the range. In addition to the main access points, there are approximately 87 entrances throughout the range which provide limited access and are protected by locked gates. (WSMR 1994)

As a safety precaution, an agreement with the state of New Mexico allows WSMR to establish off-range roadblocks on U.S. Highways 70 and 380. Under the agreement, a roadblock may last no longer than 1 hour 15 minutes. U.S. Highway 70 is subject to an average of approximately one roadblock per day. U.S. Highway 380 is subject to approximately one roadblock per month. WSMR also establishes an average of five internal roadblocks per day. Roadblocks can occur anywhere on the main range and are from 2.5 to 3 hours in length. (WSMR 1994)

The road network on WSMR is extensive and in an acceptable state of repair. Major roads are two lane roads that are paved, graded, and maintained as funding permits. They have the capacity to support 1,200 cars per hour per lane. (WSMR 1994)

Southern Pacific Railroad provides rail service to WSMR. Although there are no railroad tracks on WSMR itself, a railhead exists directly outside the gate at ORC. (WSMR 1994)